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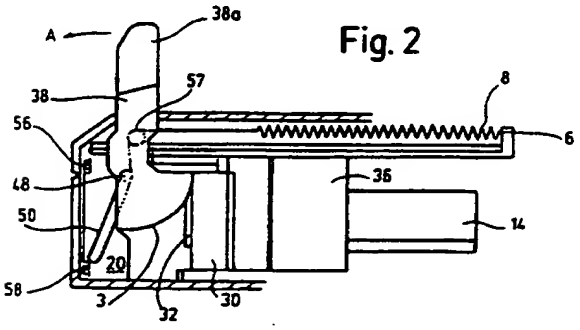
(54) A printing device with automatic cut

(57) A printing device, in particular a tape printer for multi-layer tape, has a printing mechanism and a cutting mechanism. The cutting mechanism includes two blades, one of which 102 is arranged to cut through all layers of the multi-layer tape and the other 104 which is arranged to cut through one or more layers, but leaving at least one layer intact (to provide a so-called "tab cut"). An anvil holder has two rolling anvils 106, 108 which cooperate with the two respective blades. A user interface is provided which has data input components for allowing a user to define an image to be printed and a cutter control component for allowing a user to select a cutting mode. The cutter controller is responsive to the selected cutting mode to either operate both of the cutting blades or to deactivate the first cutting blade.

Fig. 2



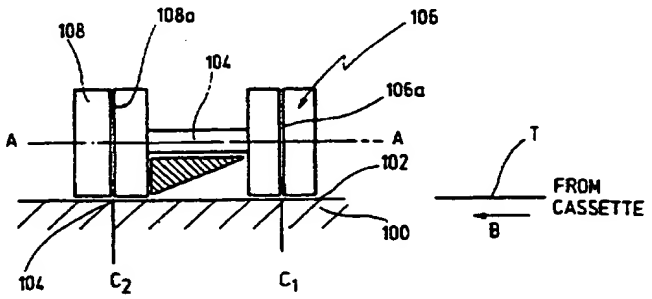


Fig. 3

GB 2313081 A

Fig. 2

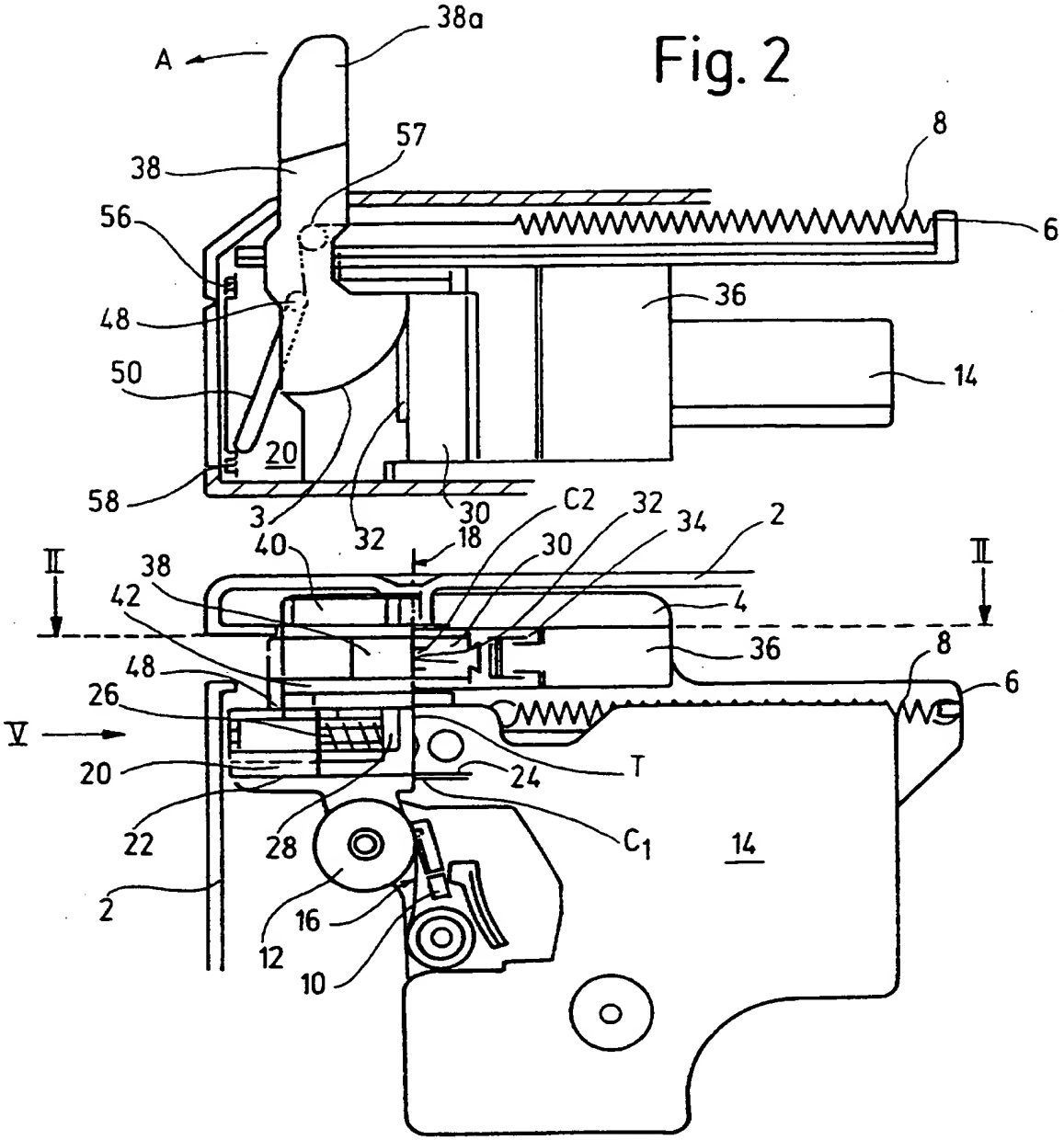

38a
A
57
8
38
56
6
36
48
14
50
20
58
3
30
32
C2
32
34
2
40
18
30
II
II
38
42
4
36
8
48
6
26
V
20
24
T
22
28
C1
14
2
16
12
10

Fig. 1

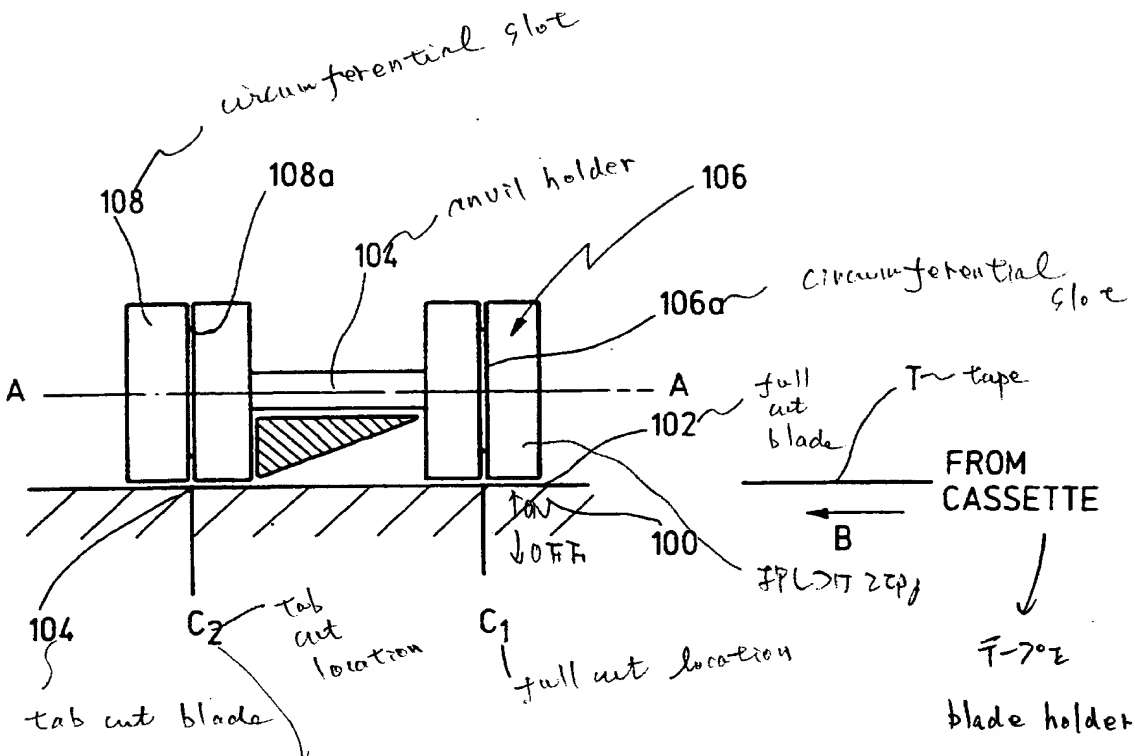


Fig. 3

押しエアリ → コロ

テープ

blade holder (100) は 押しつけて 往復工. 裏面から表面へ移動する. tab cut blade (104) は固定だ. full cut blade (102) は ON/OFF 信号により 106 側に近づいたり離れたりすることにより full cut を行なう.

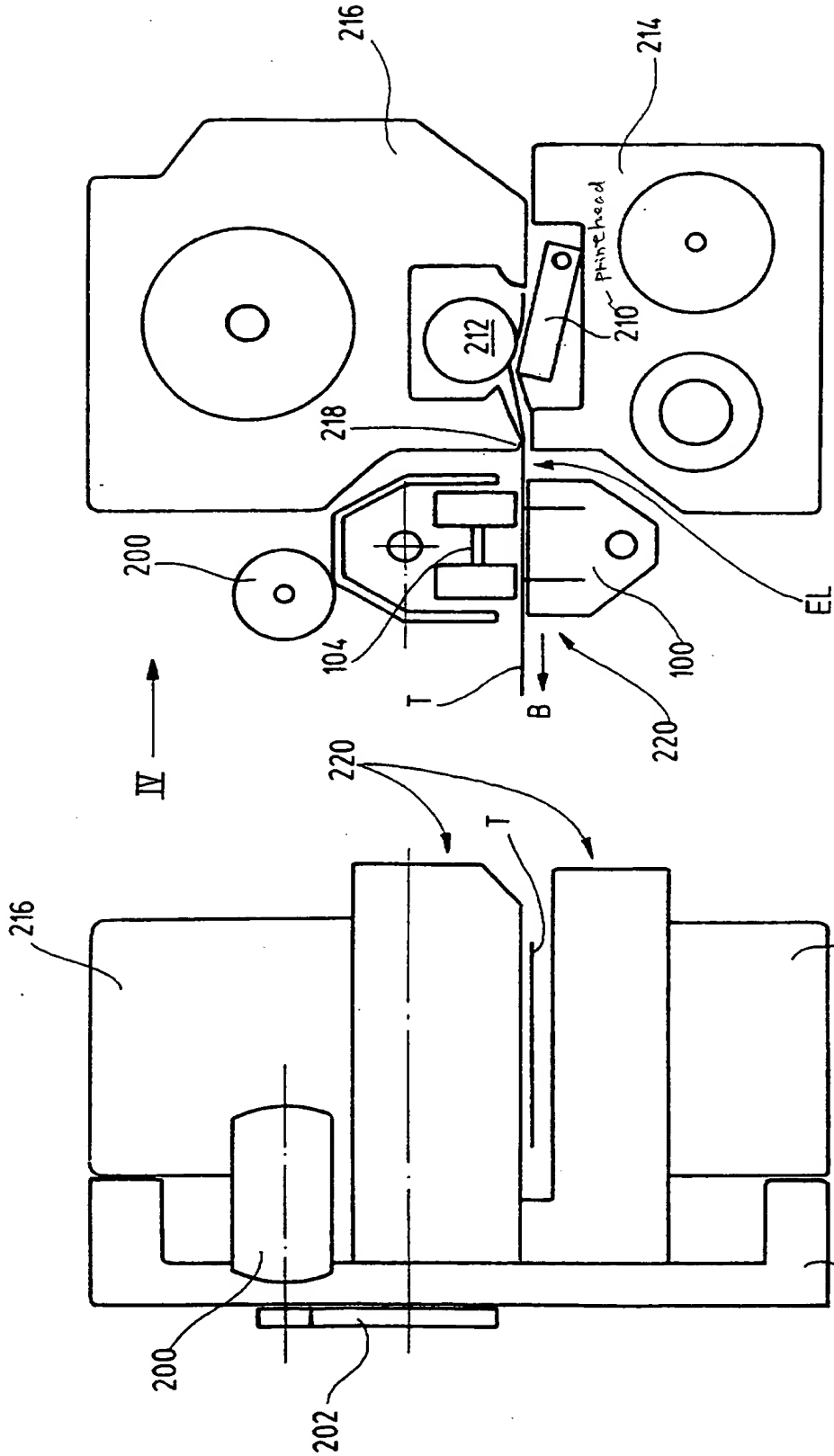

216
214
Printhead
210
212
218
200
104
100
EL
T
B
220
IV
220
T
216
214
200
202
222

Fig. 4B

Fig. 4A

Fig. 5A

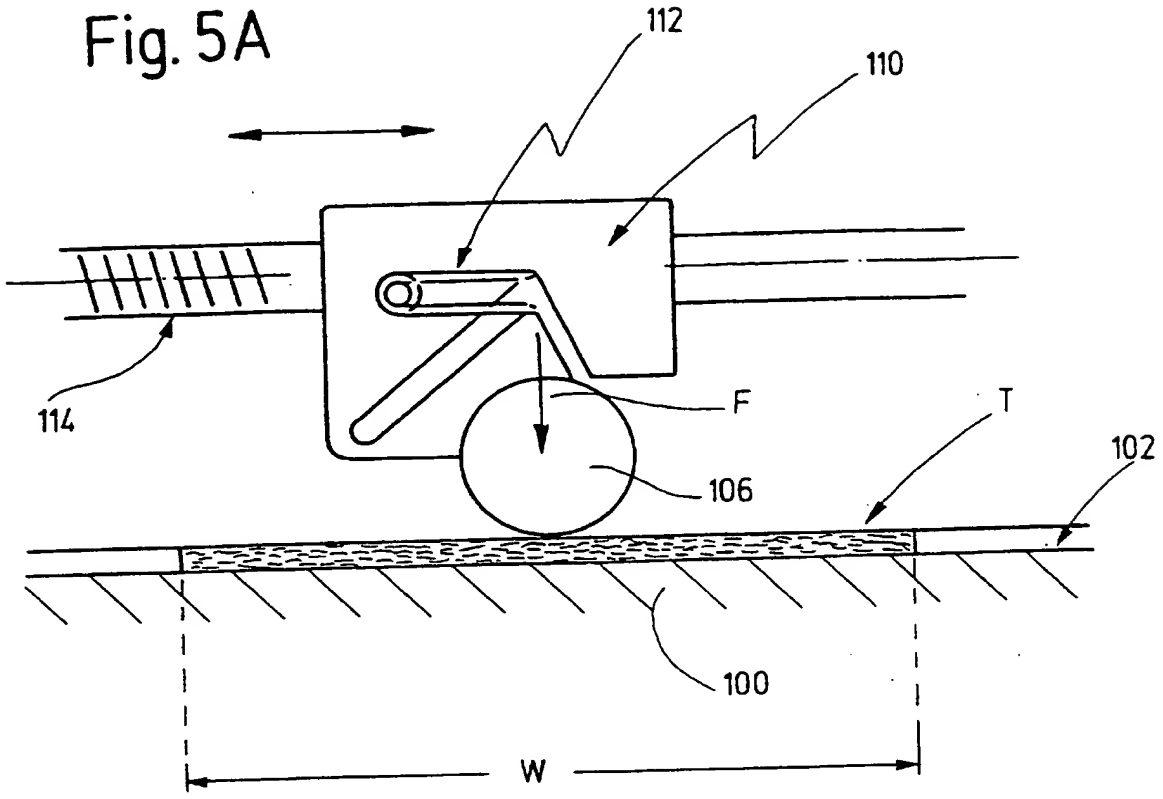
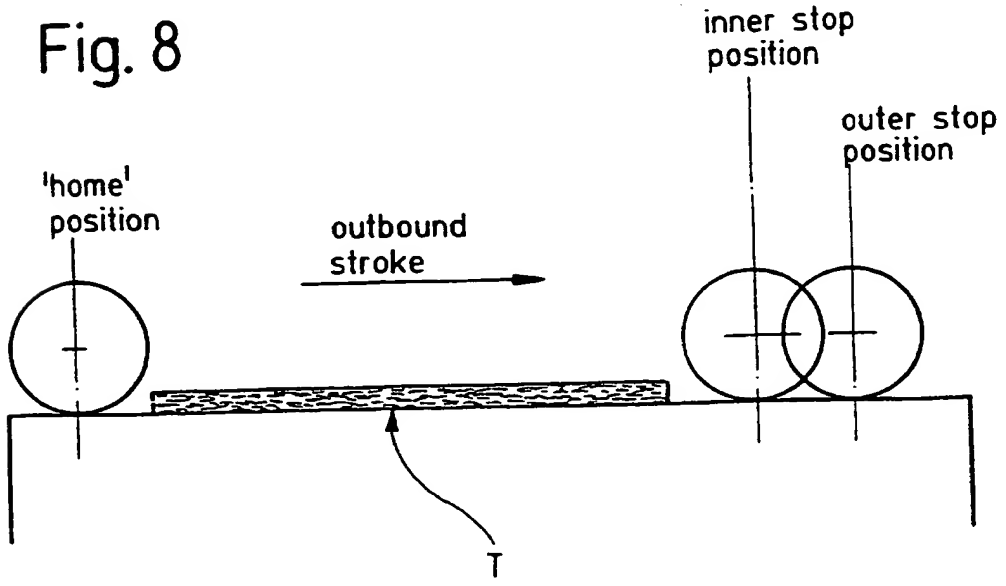

112
110
114
F
T
102
106
100
W

Fig. 8


inner stop position
outer stop position
'home' position
outbound stroke
T

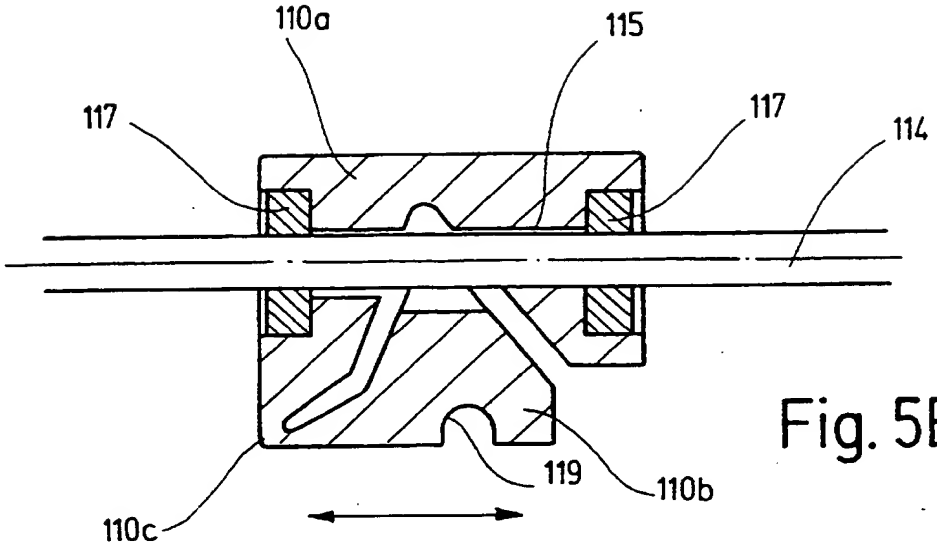


Fig. 5B

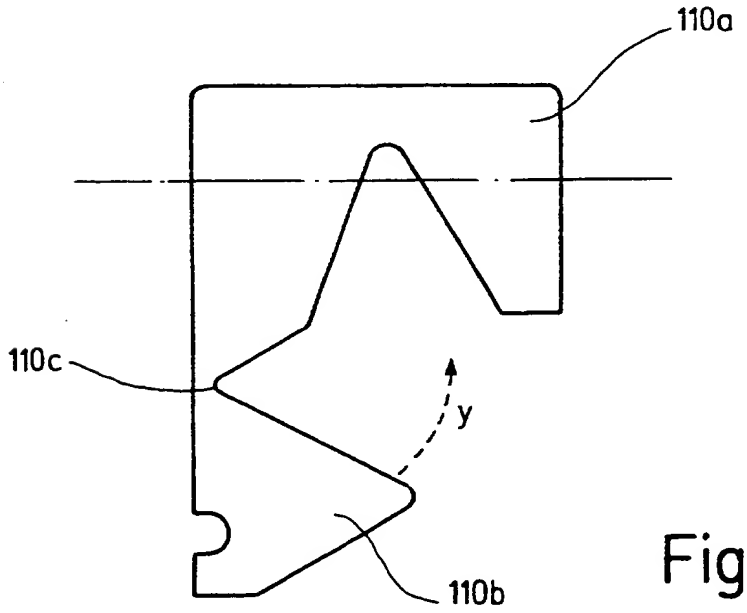


Fig. 5C

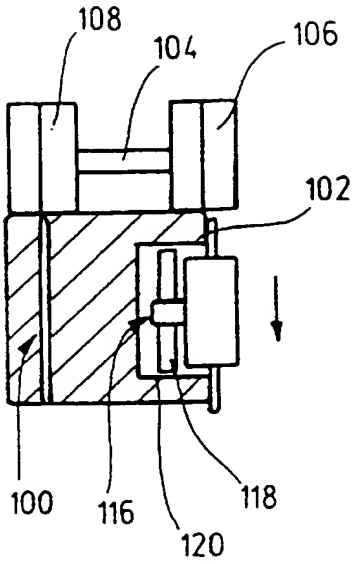


Fig. 6

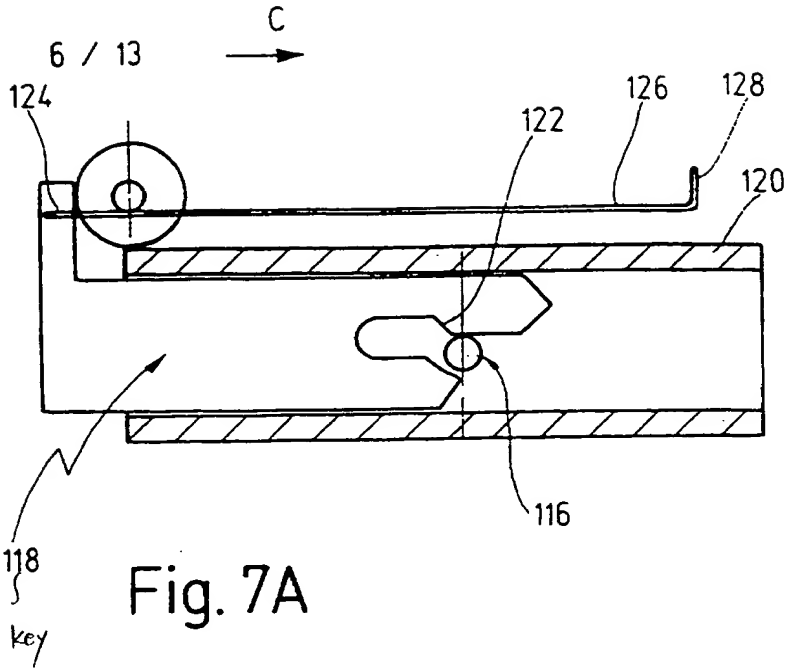


Fig. 7A

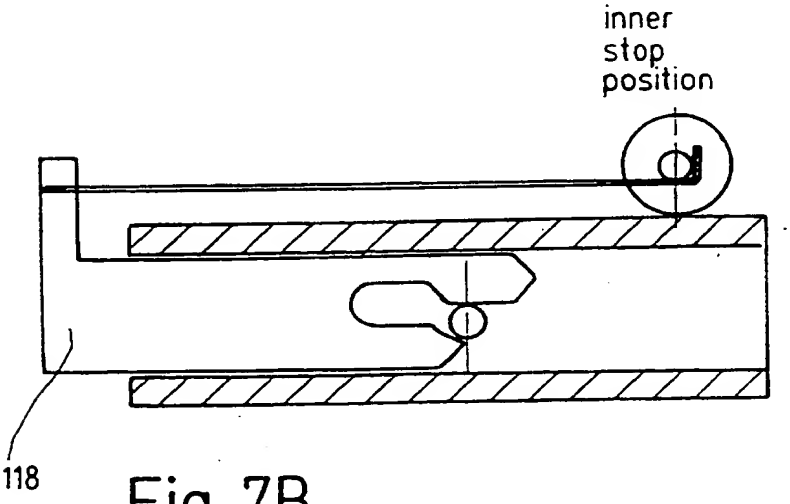


Fig. 7B

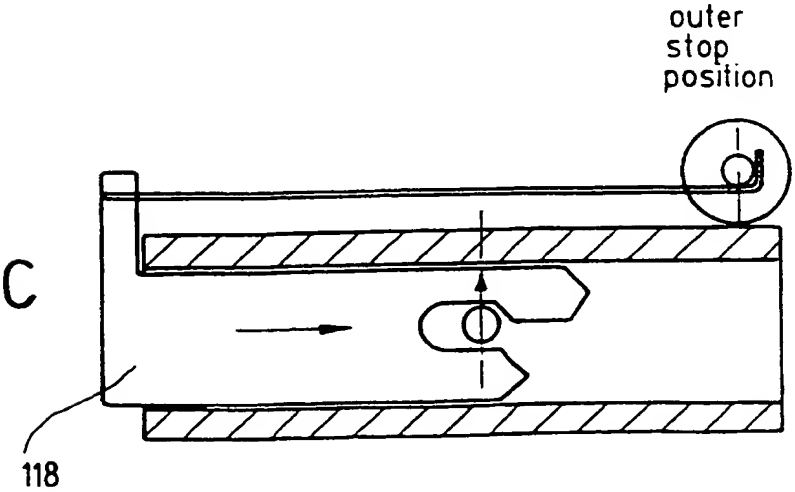
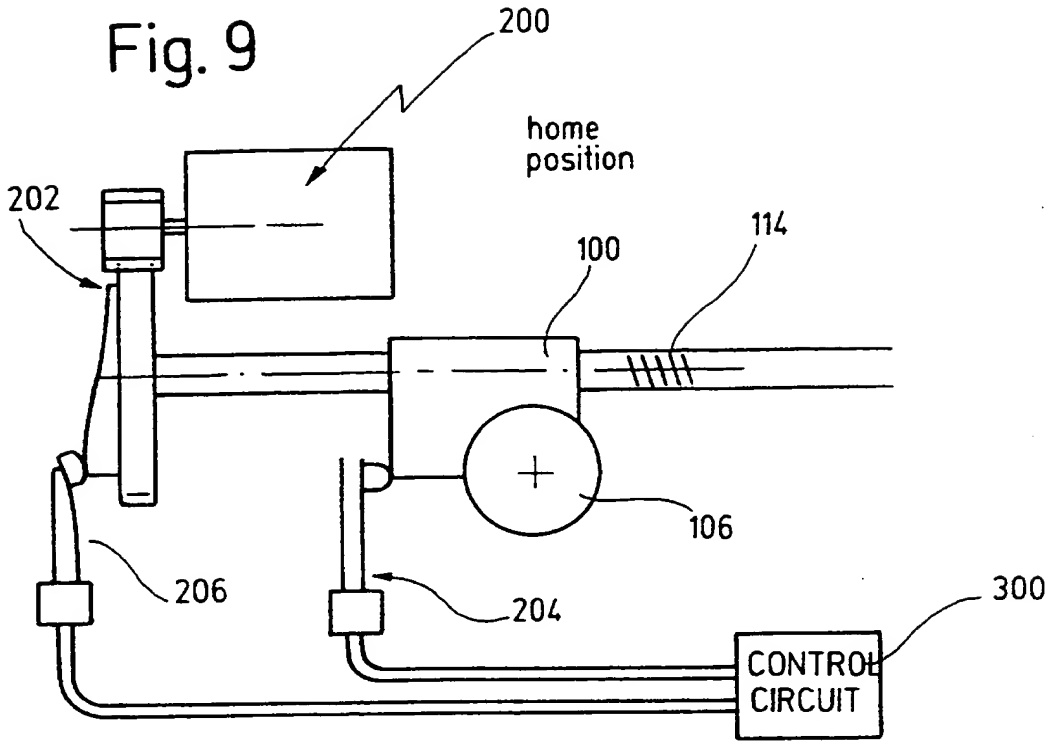


Fig. 7C

Fig. 9


200
home
position
202
114
100
106
206
204
300
CONTROL
CIRCUIT

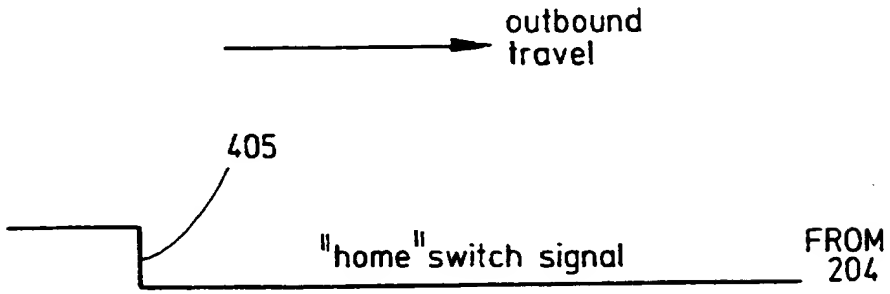
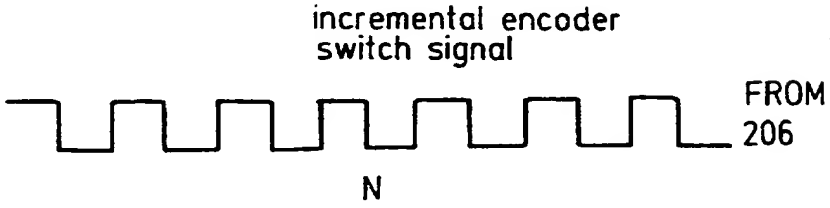

outbound
travel
405
"home" switch signal
FROM
204

Fig. 10


incremental encoder
switch signal
FROM
206
N

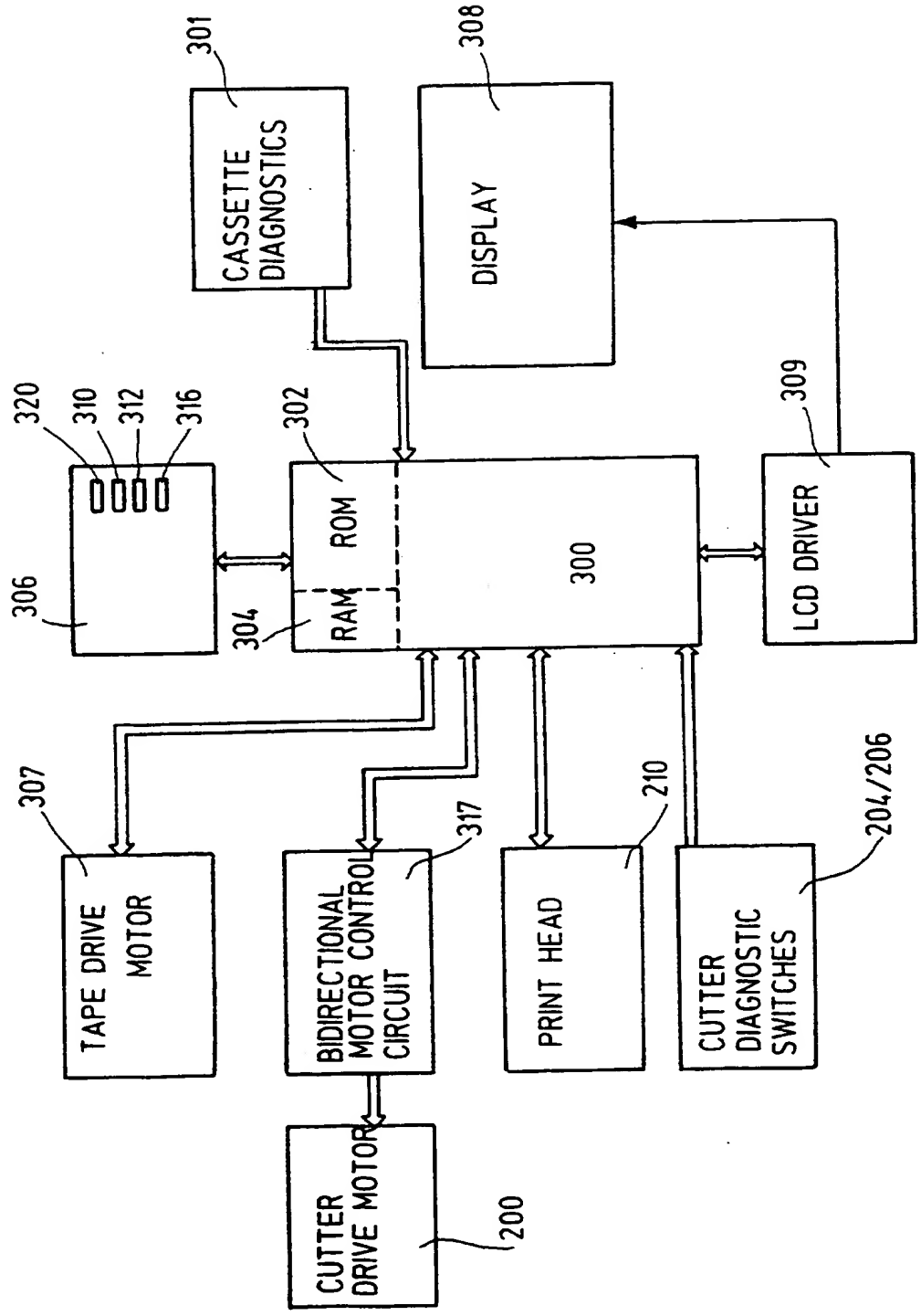

301
CASSETTE DIAGNOSTICS
308
DISPLAY
320
310
312
316
302
309
306
ROM
RAM
304
300
LCD DRIVER
307
317
210
204/206
TAPE DRIVE MOTOR
BIDIRECTIONAL MOTOR CONTROL CIRCUIT
PRINT HEAD
CUTTER DIAGNOSTIC SWITCHES
CUTTER DRIVE MOTOR
200

Fig. 11

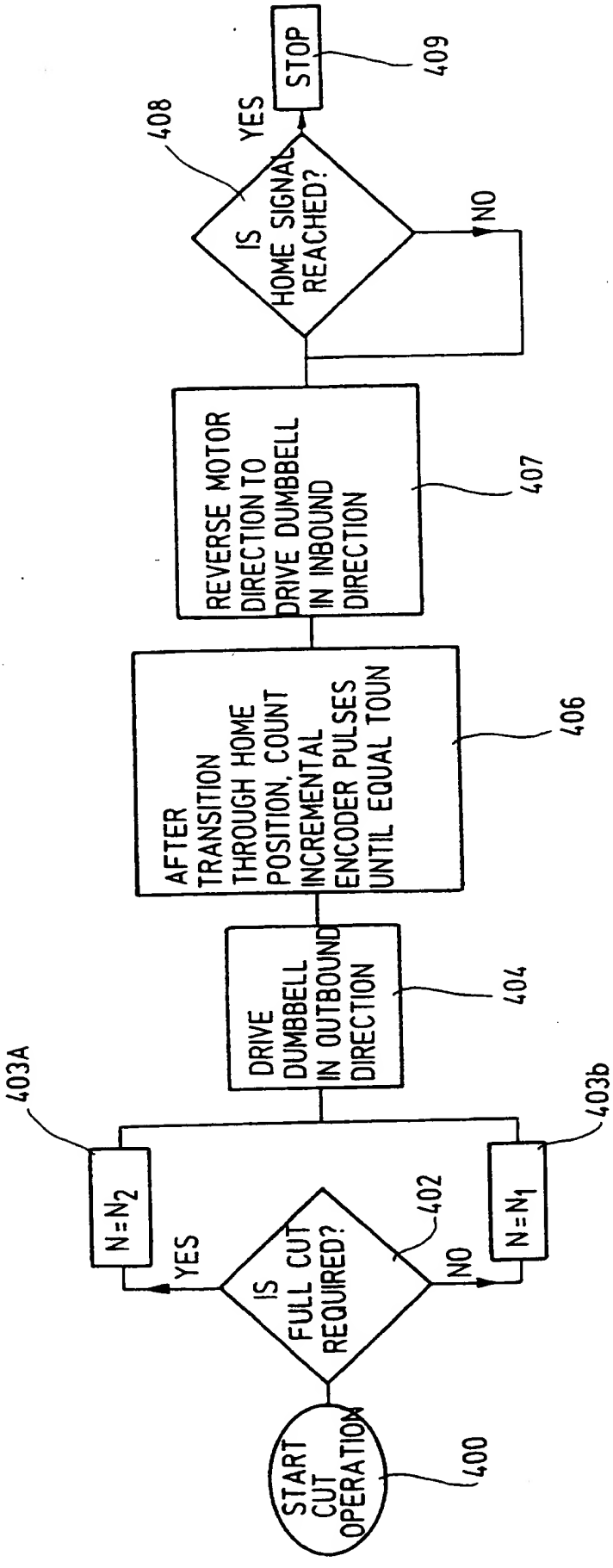

START CUT OPERATION
400
IS FULL CUT REQUIRED?
402
YES
NO
N=N2
403A
N=N1
403b
DRIVE DUMBBELL IN OUTBOUND DIRECTION
404
AFTER TRANSITION THROUGH HOME POSITION, COUNT INCREMENTAL ENCODER PULSES UNTIL EQUAL TOUN
406
REVERSE MOTOR DIRECTION TO DRIVE DUMBBELL IN INBOUND DIRECTION
407
IS HOME SIGNAL REACHED?
408
YES
NO
STOP
409

Fig. 12

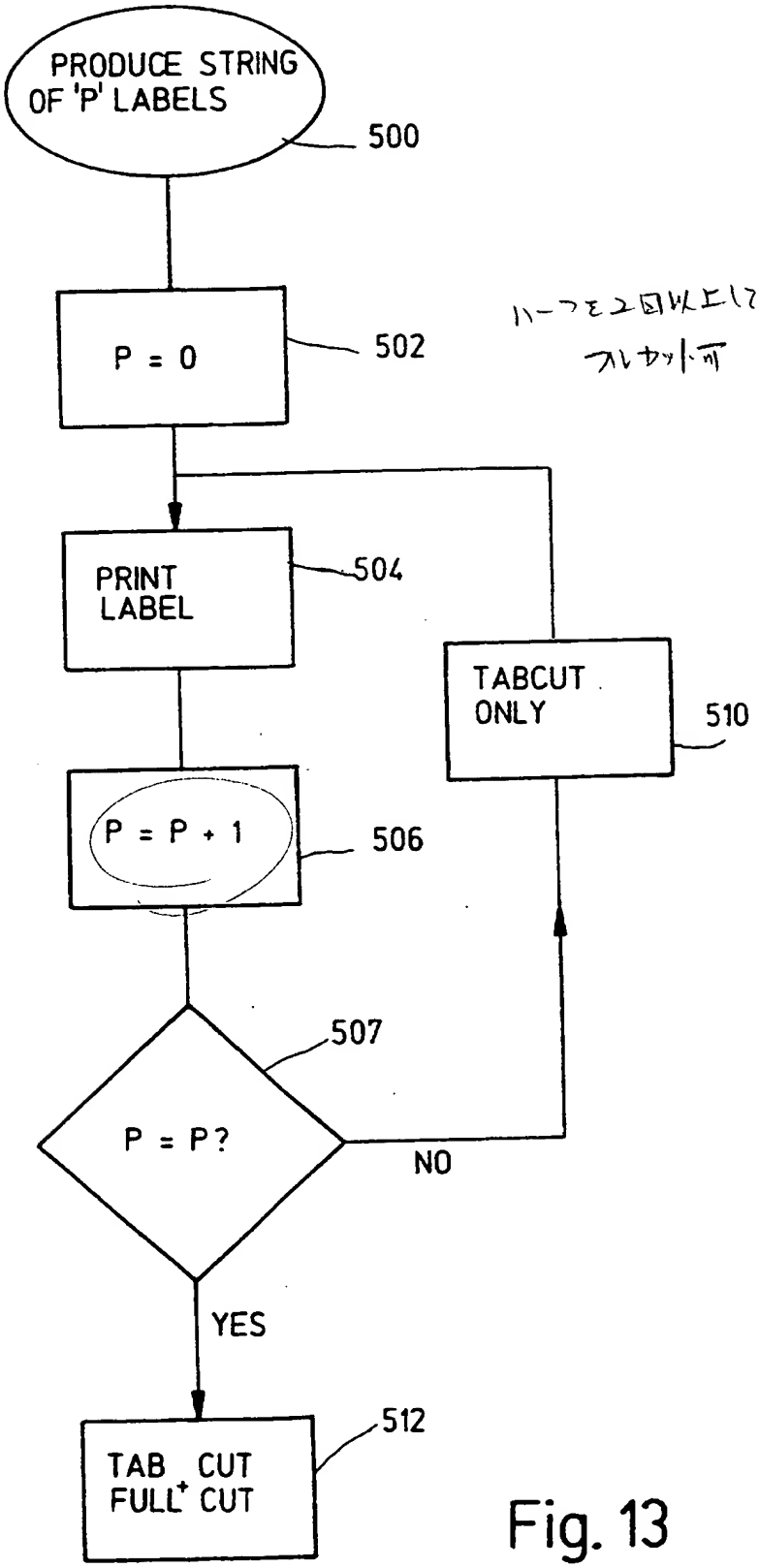

PRODUCE STRING OF 'P' LABELS
500
P = 0
502
PRINT LABEL
504
TABCUT ONLY
510
P = P + 1
506
507
P = P?
NO
YES
TAB CUT FULL CUT
512

Fig. 13

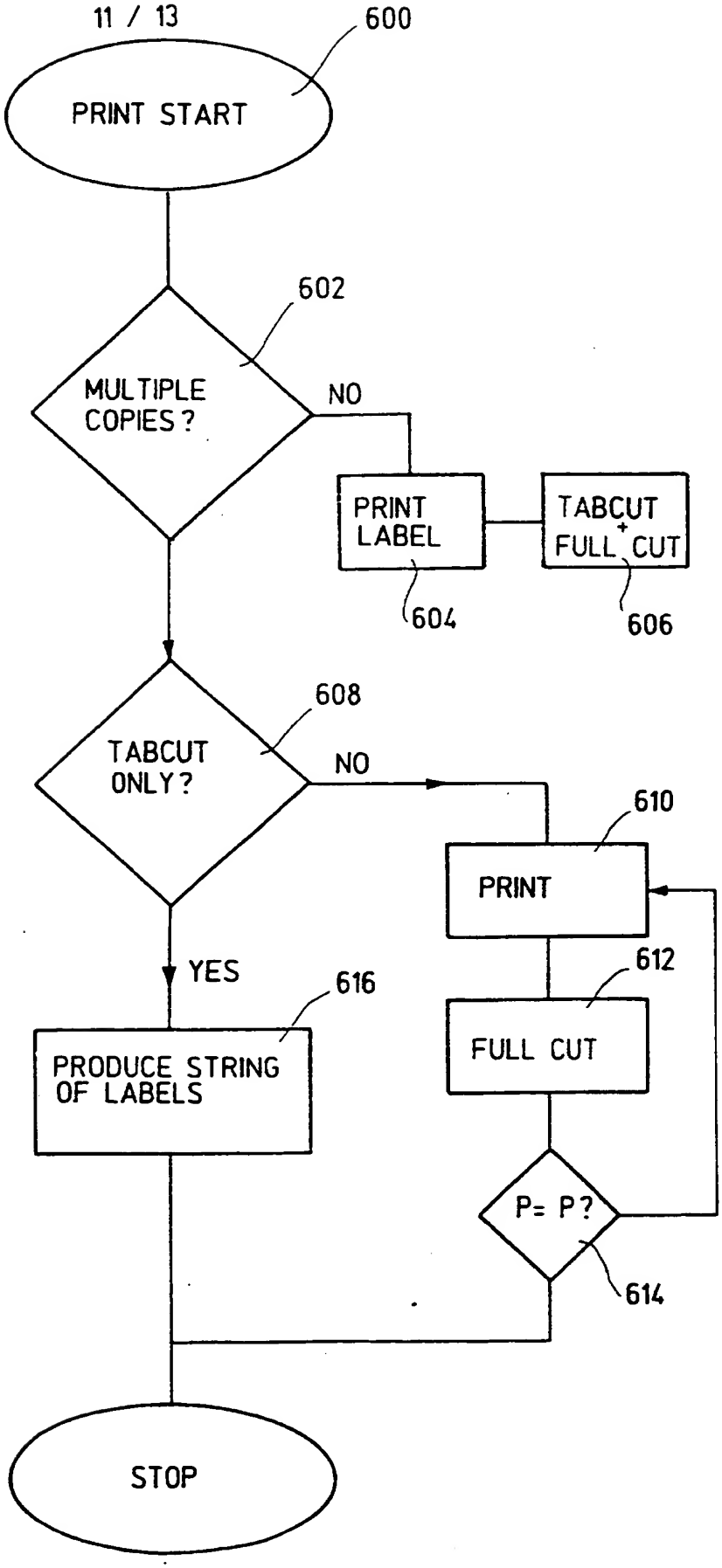

600
PRINT START
602
MULTIPLE COPIES?
NO
PRINT LABEL
TABCUT + FULL CUT
604
606
608
TABCUT ONLY?
NO
610
PRINT
612
FULL CUT
YES
616
PRODUCE STRING OF LABELS
P= P?
614
STOP

Fig. 14

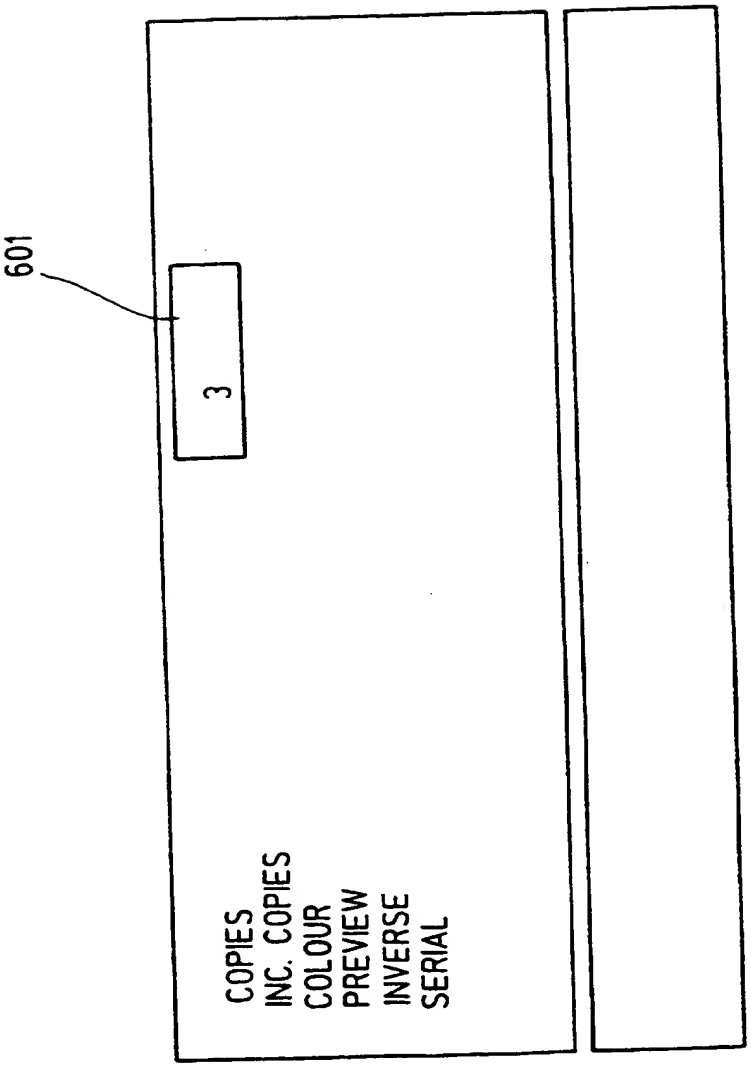


Fig. 15

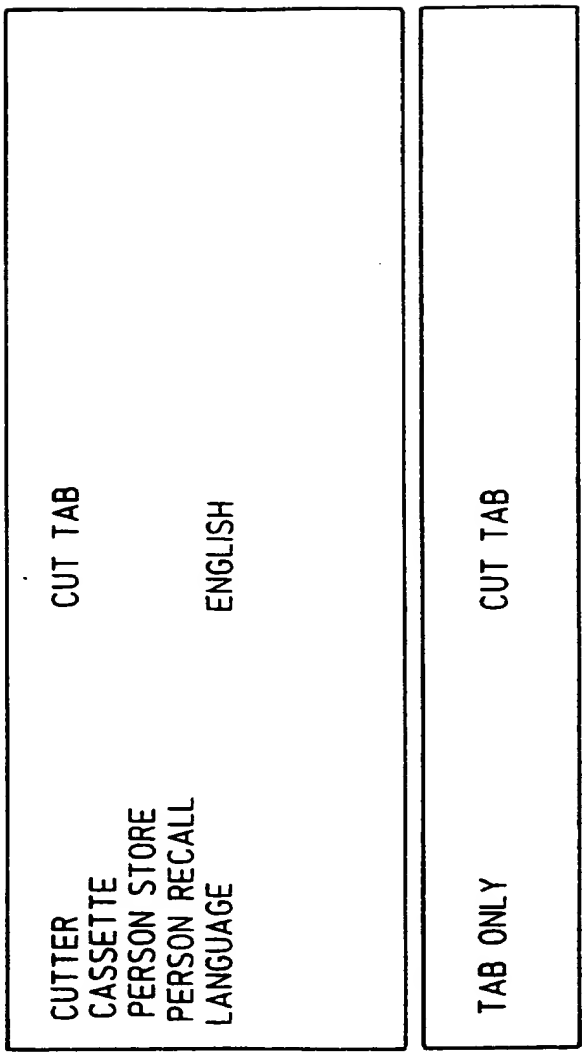

CUTTER
CASSETTE
PERSON STORE
PERSON RECALL
LANGUAGE
CUT TAB
ENGLISH
TAB ONLY
CUT TAB

Fig. 16

A PRINTING DEVICE WITH AUTOMATIC CUT

The present invention relates to a printing device with a facility for implementing an automatic cut.

Electronic printing devices are known which use a supply of multi-layer tape, housed in a cassette received by the printing apparatus. The multi-layer tape comprises an image receiving layer and a backing layer secured to one another by an adhesive layer. After an image has been printed onto the image receiving layer the backing layer can be removed allowing the image receiving layer to be secured to an object using the adhesive layer. Such printing apparatus includes a cutting mechanism for cutting off a portion of the tape after an image has been printed onto the image receiving layer so that that portion of the tape can be used as a label. For this purpose, the cutting mechanism includes a blade which is intended to cut through all of the layers of the multi-layer tape. In some printing apparatus, the cutting mechanism also includes a so-called tab cut blade which is intended to cut only through one of the layers of the multi-layer tape, the image receiving layer or the backing layer, leaving the other layer intact. For example, in a machine made and sold by the present Applicants under the trade mark DYMO 6000, a tab cut blade is provided which cuts through the top image receiving layer whilst leaving the backing layer intact. Such a tab cut allows easy separation of the image receiving layer from the backing layer.

As described in EP-A-578372, the full cut can be disabled so that the tab cut only operates. This allows a string of labels to be produced secured to a common backing strip and separated only by a "score cut". However, the disabling of the full cutting mechanism must be done manually. From a practical point of view, this means that the machine must be in the vicinity of a user.

It is increasingly desirable to provide for remote printing devices which can operate by communication with host PCs or other desktop label formulation apparatus. Thus, it is often desired to control printing and cutting of labels remotely from the printing apparatus itself.

According to the present invention there is provided a printing device comprising:

a printing mechanism for performing printing operations on a recording medium;

a cutting mechanism for performing cutting operations on a multi-layer tape, the cutting mechanism comprising first and second cutting blades, the first cutting blade being arranged to cut through all layers of the multi-layer tape and the second cutting blade being arranged to cut through one or more layers of the multi-layer tape, but leaving at least one layer intact and spaced at a location lengthwise of the tape with respect to the first cutting blade;

a user interface comprising data input components for allowing a user to define an image to be printed and a cutter control component for allowing a user to select a cutting mode; and

a cutter controller connected to receive a cutter control signal from the user interface and responsive to said signal to selectively deactivate the first cutting blade in one of said selected cutting modes.

The user interface does not need to form part of a common housing with the printing mechanism and cutting mechanism, but could be remote therefrom. What is important is that a user can use the user interface to control the cutting mechanism, without the need for manual intervention.

This also allows the user to have the facility to implement various other label options, such as multiple copies of

incrementing labels and copies counter much more simply than with earlier printing devices.

For a better understanding of the present invention and to show how the same may be carried into effect reference will now be made by way of example to the accompanying drawings in which:-

Figure 1 is a plan view of a cutting mechanism in a printing device with a cassette present;

Figure 2 is a section taken along lines II-II of Figure 1, showing the rolling anvil in a start position;

Figure 3 is a sketch of components of a second cutting mechanism;

Figures 4A and 4B are a side view and plan view of a different cassette layout;

Figure 5A is a view of the second cutting mechanism;

Figure 5B is a section through the carriage;

Figure 5C is a sketch of the carriage block in its moulded form;

Figure 6 illustrates components of a cutting mechanism capable of selectively disengaging the full cut blade;

Figures 7A to 7C is an end view of the cutting mechanism of Figure 6;

Figure 8 is a sketch showing different stop positions of the anvil holder;

Figure 9 is a diagram showing the drive and sensing components of the cutting mechanism of Figure 6;

Figure 10 is a diagram showing signals from the sensing component of Figure 9.

Figure 11 is a block diagram of control circuitry;

Figure 12 is a flow chart showing operation of the selective cutting operation;

Figure 13 is a flow chart showing operation in a strip label mode;

Figure 14 is a flow chart illustrating selection of options by a user;

Figure 15 shows the display options in a special mode; and Figure 16 shows the display options in a set up mode.

Figure 1 is a plan view of a cutting mechanism as described in our earlier European Application Publication No. 0711637 shown in a printing apparatus having a printing mechanism and in which a cassette is located. Reference numeral 2 designates a casing of the printing apparatus defining a cassette receiving bay. Within the casing 2 is located a base plate 4 which includes an upstanding part 6 used for mounting a return spring 8. The printing mechanism includes a print head 10 and a platen 12 which cooperates with the print head to effect printing on an image receiving tape T. The printhead 10 and platen 12 are mounted within the casing 2 on the base plate 4. The printhead 10 is movable from the operative position as shown in Figure 1 to an inoperative position in which it is spaced from the platen 12 to allow easy removal and insertion of a cassette. Reference numeral 14 denotes a cassette located in the cassette receiving bay. The cassette 14 holds a supply of ink ribbon and image receiving tape which extend in overlap between the platen and print head. The ink ribbon is then wound back within the cassette 14 and the image receiving tape extends out of the printer. Reference numeral 16 denotes the printing zone where the image receiving tape and ink ribbon extend in overlap and reference numeral 18 denotes the zone where the tape exits from the printer. Between the zones marked 16 and 18 is an area in which cutting takes place in a manner which will be more fully described.

The cutting mechanism has two main components. The first component comprises a cutter body 20 on which is mounted a blade 22. The blade is intended to cut through the full thickness of the tape T into a slot 24 provided within the cassette 14 at a first cutting location C1. The cutter body 20 moves on supports 56,58. The cutter body 20 includes at its surface adjacent the

tape 18 a tape clamp 28 for holding the tape T against a supporting surface of the cassette 14 during cutting. Reference numeral 26 denotes a tape clamping spring of which there are two, one associated with each support 56,58. Operation of this part of the cutting mechanism is disclosed in our European Patent Application Publication No. 0634275, the contents of which are herein incorporated by reference.

The second part of the cutting mechanism provides a so-called tab cut through the tape at a second cutting location C2 spaced from the fixed cutting location. The tape is a multi-layer tape including at least an upper layer, an adhesive layer and a backing layer which can be removed from the adhesive layer so that the upper layer may be secured to an object using the adhesive layer. An image or message is printed on the upper layer of the tape. In Figure 1, the upper layer of the tape T is to the right of the figure, adjacent the print head. The second part of the cutting mechanism includes a blade holder 30 which holds a so-called tab cut blade 32. The tab cut blade holder 30 is mounted in a tab cut sprung body 34 which itself is sprung against a tab cut support part 36 of the printer. This part of the cutting mechanism also includes a so-called rolling anvil 38. The rolling anvil 38 is rolled down against the tab cut blade 32 causing a cut to be made progressively across the width of the tape T. The depth of cut is controlled so that the cut is made only through the upper layer of the tape, leaving the backing layer intact.

The rolling anvil 38 can be seen more clearly in Figure 2 which is a view taken along line II-II in Figure 1. It has an arcuate anvil surface 3 and an actuating part 38a. Figure 1 and 2 show the rolling anvil in the start position. The rolling anvil 38 has its motion controlled by two guides, a first guide 40 located towards the casing 2 of the printer and a second guide 42 located inwardly towards the cassette receiving bay. The guides 40,42

include guide tracks for controlling the motion of the rolling anvil 38. To allow it to be guided, the anvil has two protrusions, for example in the form of balls or pins located respectively towards the ends of its arcuate anvil surface 3. The pins cannot be seen in Figure 2 because they are on the side of the rolling anvil away from the viewer. The equivalent pins located on the side of the anvil facing the viewer for cooperation in similar guide tracks in the guide 40 have been omitted from Figure 2 for the sake of clarity. It will be appreciated that it may not be necessary in all circumstances to positively guide the anvil from both sides. Guiding by one guide only at one side may be sufficient. The rolling anvil also carries a cutter body actuation pin 48. This pin is on the side of the anvil 38 away from the viewer in Figure 2. The cutter body 20 includes a track 50 shown in Figure 2 in which the pin 48 on the anvil 38 runs. The track 50 extends at an angle as shown in Figure 2.

Operation of the earlier cutting mechanism will now be described. Figure 2 illustrates the start position. In this position, the return spring 8 which extends between the upstanding part 6, round the pulley member 52 to the cutter body actuation pin 48 is in a relaxed state. The guide pins are located in an upper portion of the guide track. The cutter body 20 is in a position holding the blade 22 spaced from the tape 18. To make a cut, the actuation part 38a of the rolling anvil 38 is moved in the direction of arrow A in Figure 2. Motion of the anvil is controlled by movement of the guide pins in the guide track. Movement is controlled in a manner which ensures that the arcuate anvil surface rolls along the surface of the tab cut blade holder 30 progressively tab cutting the tape as it goes at the second cutting location C2. The guide pins and guide track are located to ensure that the motion is an accurate, repeatable rolling motion.

As the rolling anvil 38 moves, the cutter body actuation pin is caused to move along the track 50 in the cutter body 20. This causes the cutter body 20 to be moved to the right in Figure 2. Movement of the cutter body actuation pin downwardly also causes the return spring 8 to be extended and placed in a tensioned state. As the cutter body 20 moves to the right in Figure 2, the blade 22 supported by the cutter body 20 performs a full cut through the tape T at the cutting location C1.

Figure 3 shows an implementation of a cutting mechanism according to an embodiment of the present invention. This cutting mechanism is for a situation where a cassette like the cassette 14 in Figure 1 does not provide a tape support wall with a slot 24, but instead terminates in a guide portion downstream of the print location. Thus, the cutting mechanism is located wholly outside the cassette boundary where the tape exits the cassette. Moreover, the cassette need not contain both image receiving tape and thermal transfer tape. The thermal transfer tape could be in a separate cassette or dispensed with altogether.

Such an arrangement is illustrated in Figures 4A and 4B. In Figure 4B, the baseplate of the printing mechanism has been omitted for the sake of clarity, although it will be appreciated that the cassettes are received in a cassette receiving bay of a printing device. The printing device has a printing mechanism comprising a printhead 210 and a platen 212, similar to that described earlier. Figure 4B illustrates an ink ribbon cassette 214 which houses a supply of ink ribbon or thermal transfer ribbon and a substrate cassette 216 which houses a supply of image receiving tape. The image receiving tape and the ink ribbon are passed in overlap between the printhead 210 and the platen 212 for printing. The ink ribbon is then taken up back into the ink ribbon cassette 214, while the image receiving tape with a printed image thereon is fed from the print zone towards the left in Figure 4B. Rotation of the platen 212 causes this

feeding to be effected. The substrate cassette 216 has a guide part 218 at an exit location EL for the tape. Downstream of the exit location EL is a cutting mechanism 220 which will be described in more detail hereinafter. Figure 4A is a view taken from the side of Figure 4B in the direction of arrow IV. Thus, the baseplate 222 of the printing mechanism can be seen supporting the ink ribbon cassette 214 and the substrate cassette 216. Also, the tape T can be seen exiting towards the viewer in Figure 4A. The cutting mechanism 220 itself will now be described in more detail.

Referring to Figure 3 the cutting mechanism has a blade holder 100 which carries a full cut blade 102 intended to cut through the full thickness of all layers of a multi-layer tape and a tab cut blade 104 which is intended to cut through only one or more layers of a multi-layer tape, but leaving the backing layer intact. The cutting mechanism also includes an anvil holder 104 which carries two "rolling anvils". The first of these 106 is intended to cooperate with the full cut blade 102, and the second of these 108 is intended to cooperate with the tab cut blade 104. The anvil holder 104 takes the form of a central shaft rotatable about axis A-A. Each of the rolling anvils has a narrow circumferential slot 106a,108a respectively. The slot is in each case aligned with its respective blade to remove direct contact between the blade and the anvil. In Figure 3 the tape T is shown diagrammatically exiting the cassette in the direction of arrow B towards the cutting mechanism. The cutting locations C1 and C2 are spaced apart similarly as in Figure 1 to provide a full cut at cutting location C1 and a tab cut at cutting location C2, as selected in the manner described hereinafter.

Figure 5A is a view taken from the end of the cutting mechanism. It is taken looking along the direction of the tape T from the cassette. Thus, the blade holder 100 can be seen sectioned with the full cut blade 102 being visible. In Figure 5A the width of

the tape is denoted w. This may vary according to the width of tape inserted. The anvil holder 104 is mounted on a carriage 110 and is held under constant force against the blade holder 100 under the action of a spring 112. The downwards force is denoted by arrow F. The carriage can be moved back and forth widthwise of the tape T under the action of a motor driven lead screw 114. As the carriage is driven by the lead screw, the rolling anvils 106 and 108 rotate thereby causing the tape T to be cut against the action of the blades at the cutting locations C1 and C2.

Figure 5B is a section through the carriage 110, showing its operation in more detail. The lead screw 114 extends through an aperture 115 in the carriage 110 and is received by threaded nuts 117 at either end of the aperture. Rotation of the lead screw 114 therefore causes the carriage 110 to move laterally in Figure 5B.

The carriage 110 consists of a main body portion 110a and a hinged portion 110b. The hinged portion 110b has a recess 119 for receiving the shaft 104 of the rolling anvil. The hinged portion 110b is hinged relative to the body portion 110a at hinge 110c. Thus, the spring 112 acts between the main body portion 110a and the hinged portion 110b to apply the downwards force F explained above with reference to Figure 5A.

For ease of manufacture, the carriage is manufactured as a single unit in which the hinged portion 110b is open relative to the body portion 110a. This is shown in more detail in Figure 5C. By manufacturing the carriage as a single unit in this way, the spring can be mounted onto the carriage and the hinged portion 110b folded back in the direction of arrow Y, thus simplifying manufacture.

In a preferred embodiment of the invention, the full cut blade can be selectively engaged or disengaged to allow the cutting

mechanism either to perform a full cut with a tab cut, or a tab cut only. A cutting mechanism having this facility is shown in Figure 6. Figure 6 is a view similar to Figure 3 and shows the rolling anvils 106 and 108 mounted on the anvil holder 104. The full cut blade 102 is mounted on a cut blade pin 116 which is actuated by a key 118. The key 118 is a substantially planar component having an elongate part which runs in a guide groove 120 formed in the blade holder 100. Figure 7A is an end view of the cutting mechanism which shows the key in more detail. In Figure 7A, the key is shown in its retracted position. The key 118 has at its right hand side shown in Figure 7A a cammed portion 122 which engages the cut blade pin 116. The key 118 has at its left hand side as shown in Figure 7A an actuating part 124 which extends upwardly from the elongate part of the key. The actuating part 124 carries an actuating component 126 which extends lengthwise of the blade holder, that is in the direction of movement of the carriage 110. It has at its end a stop part 128. The location of the stop part 128 is arranged in the following manner.

Figure 7A shows the anvil holder 104 in its "home" position, that is at the extreme left hand side of its travel as shown in Figure 7A. In that position, it holds the actuating component 124 of the key 118 so that the cammed portion 122 holds the cut blade pin 116 downwards, disengaging the full cut blade 102. As the anvil holder 104 rolls from the home position to the right hand side of Figure 7A in the direction of arrow C, a tab cut only is performed on the tape. The anvil holder 104 has two stop positions, an inner stop position shown in Figure 7B and an outer stop position shown in Figure 7C. In the inner stop position, the shaft of the anvil holder just abuts the stop part 128 of the actuating component 126 and thus causes no movement of the key 118. Therefore, the full cut blade remains in its disengaged position and when the anvil holder returns on its return stroke from the inner stop position to its home position, no full cut

of the label is made.

However, if the anvil holder 104 rolls to the outer stop position shown in Figure 7C, it will readily be understood that it has now engaged the stop portion 128 of the actuating component 126 and therefore pulled the key 118 to the right. Thus, the cammed portion has now released the cut blade pin 116 so that the full cut blade 102 is returned to its cutting position. Therefore, on the return stroke of the anvil holder 104 to its home position, a full cut is produced through the tape.

Figure 8 shows the home position, inner stop position and outer stop position with reference to the maximum width of the tape T. This arrangement thus allows a user to select whether or not both a full cut and a tab cut are to be made, or a tab cut only. This can be done automatically using the arrangement shown in Figure 9. Figure 9 does not show the blade holder, but shows the carriage 100 with the rolling anvil 106. As described above with reference to Figure 5A, the carriage 100 is driven on a lead screw 114. Reference numeral 200 denotes a dc motor which is used to drive the lead screw through a gear reduction pair 202. A first leaf switch 204 is provided to detect the home position of the anvil holder 104. Detection of the inner stop position and outer stop position is accomplished through a second leaf switch 206 which detects revolutions of a second gear of the gear reduction pair 202. This can for example be by a face cam on the second gear. Thus, for every revolution of the lead screw 114, a pulse will be generated at the second leaf switch 206, thus forming a simple incremental encoder. Figure 10 illustrates the respective signals from the leaf switch 204 and the leaf switch 206. The leaf switches 204/206 are referred to herein as diagnostic switches.

Figure 11 is a block diagram of circuitry of a printing device for implementing the above-referenced feature. Figure 11

illustrates a central controller 300 for the printing device, which includes a microprocessor, ROM 302 and RAM 304. The controller 300 is connected to an LCD driver 309 for driving a display 308 of the printing device. As denoted by the jagged line across the interconnection between the controller 300 and the LCD driver 309, the display and its driver can be located remotely from the printing device itself. The controller 300 also communicates with a keyboard or other input device 306 for receiving information concerning data to be printed and cutting operations and the like. For this, a plurality of keys are provided which are illustrated by way of example as keys 320,310,312, and 316. Once again, as denoted by the jagged line across the interconnection between the controller 300 and the keyboard 306, the keyboard could be located remotely from the printing device itself. The controller 300 is also connected to the printhead 210 and to a tape drive motor 307 for driving the platen so as to feed tape out of the printing device. The printhead and tape drive motor effect printing and feeding operations under the control of the controller in a manner known *per se*. The controller 300 is also connected to a bidirectional motor control circuit 317 which controls the operations of the cutter drive motor 200 in a manner to be described more clearly hereinafter.

The controller 300 receives information from the cutter diagnostic switches 204,206 illustrated in Figure 9. The controller 300 is also connected to cassette diagnostic switches 301 which are located in the cassette receiving bay of the printing device and which identify parameters concerning the cassette to the controller 300, such as the nature of the tape, its width etc.

The operation of the control circuitry to implement the cutting feature described above will now be explained with reference to Figure 12. In brief, the control circuit 300 receives respective

signals from the cutter diagnostic switches 204,206 and can thus determine the position of the carriage. It can consequently arrange to reverse the direction of travel of the anvil holder at a selected one of the inner stop position and outer stop position.

In more detail, Figure 12 illustrates at step 400 commencement of a cut operation. This can be done by the user depressing a cut button on the keyboard 306, or could be automatically instigated by the machine in response to having printed a certain length of label. At step 402, the controller enquires whether a full cut is required. This must be selected by a user at the time of formatting the label or at the time of instigating a cutting operation. According to the answer, a number N is set being the number of encoder pulses to expect from the diagnostic leaf switch 206. If a full cut is required, the number N is set to N2, whereas if a tab-cut only is to be implemented, the number N is set to N1. It will be apparent that N1 is less than N2 because the outbound travel of the carriage 100 for the tab-cut only case is less than where a full cut is to be implemented on the return stroke.

Step 404 causes the carriage 100 to be driven in the outbound direction by starting the motor 200. The diagnostic leaf switch 204 determines when the carriage has passed through the home position, as denoted by the transition 405 in Figure 10. This transition is detected at step 406 and the controller then proceeds to count the incremental encoder pulses derived from the diagnostic leaf switch 206. When N equals the preset number (N1 or N2 as determined by steps 403a,403b), the motor direction is reversed at step 407 to drive the carriage 100 in the inbound direction. When the home signal is reached (step 408), the sequence is terminated (step 409).

Thus, a user can request labels with or without a full cut via

a user interface of the printing device. Furthermore, a string of score cut labels can be produced and, after the last, the control circuit can cause the cutting mechanism to produce a full cut with the final tab cut, to separate the string from the printing device. More details concerning the manner in which so-called "score cut labels" can be produced is disclosed in our earlier European Application Publication No. 0578372. The contents of that Application are herein incorporated by reference.

Figure 13 is a flow chart illustrating how a string of score cut labels can be produced, with the string being finally cut off with a full cut. The flow chart in Figure 13 starts from the point when a user has requested a string of p labels, each label being separated from its neighbour only by a tab cut but remaining attached to a common strip of backing tape. This is denoted as step 500 in the flow chart.

Prior to printing of the first label, at step 502 the processor sets p = 0. The processor then prints the first label of the string at step 504. At step 506 p is incremented and at step 507 it is compared with P. Naturally, for the first label p will not equal P and therefore the full cut blade is disengaged as explained above. Thus, only a tab cut is carried out as illustrated at step 510.

When p = P, the full cut blade is no longer disengaged so that at the next cut the string of labels is cut off while simultaneously performing a tab cut on the final label. This is shown at step 512.

Figure 14 is a flow chart illustrating how a user selects an appropriate option at the user interface. As described in more detail in our copending Application No. , entitled "Printing Apparatus" (PWF Ref. 80374 - short title 6500 Interface

- Keys and Display), the printing device has a user interface comprising a display and various input keys. These input keys include a PRINT key, a set of FUNCTION keys, a SELECT key and a set of DATA INPUT keys. The function keys include a SET UP key and a SPECIAL key which allow the various cutting options discussed herein to be selected by a user. A print operation is selected by a user by depression of the print key, as indicated at step 600. By depression of the special key, a menu of label select options is displayed on the screen as illustrated in Figure 15. By using cursor keys, a user can mark one of the following displayed options:

copies
ink copies
colour
preview
inverse
serial.

A user may also enter by virtue of the data input keys a number in the displayed block 601 adjacent the selected option. The processor then determines at step 602 whether or not multiple copies have been selected. If there is only a single label, the processor proceeds to print the label at step 604 and perform a cutting operation implementing a tab cut and a full cut at step 606.

By depression of these set up function keys, a user can cause to be displayed the menu of options illustrated in Figure 16, giving the cutting options:

tab only
cut tab.

If the user has selected a tab only option, this is determined

by the processor at step 608. If a full cut has been selected, a sequence of copies of a label is printed and individually cut off with a full cut as shown in a sequence of steps 610, 612 and 614.

If a tab only selection has been made, the user goes into the sequence illustrated in Figure 13 denoted in block 616 in Figure 14.

It will be appreciated that the processor will need to make some adjustment for the lead length of a label when it is operating a score cut mode as opposed to when it is implementing a full cut. This can be done in the manner described and explained in EP 578372.

As outlined above, the user can select multiple copies of the same label. The printing device can count the number of copies and display that to a user if desired. The display can show how many copies have been printed or how many are remaining to be printed. Moreover, the printing device can be set up to provide so-called incremental copies. That is, the printing device can print a sequence of labels in which each label has a number, subsequent labels having that number plus one. Alternatively, the user can select the number of labels which are being printed with the same incremental number. Thus, for example he could select 3 copies with the same incremental number.

As a further option, the leader of a label may be reduced by commencing a print operation so that part of the label is printed, then stopping the print operation to perform a tab cut after a predetermined length has been fed, then proceeding to print the complete label. This allows shorter labels to be produced and thus minimises wastage of tape.

CLAIMS:

1. A printing device comprising:

a printing mechanism for performing printing operations on a recording medium;

a cutting mechanism for performing cutting operations on a multi-layer tape, the cutting mechanism comprising first and second cutting blades, the first cutting blade being arranged to cut through all layers of the multi-layer tape and the second cutting blade being arranged to cut through one or more layers of the multi-layer tape, but leaving at least one layer intact and spaced at a location lengthwise of the tape with respect to the first cutting blade;

a user interface comprising data input components for allowing a user to define an image to be printed and a cutter control component for allowing a user to select a cutting mode; and

a cutter controller connected to receive a cutter control signal from the user interface and responsive to said signal to selectively deactivate the first cutting blade in one of said selected cutting modes.

2. A printing device according to claim 1 wherein the cutting mechanism comprises an anvil holder carrying first and second anvils arranged to cooperate respectively with said first and second cutting blades and to be mounted for rolling motion so that as said rolling motion widthwise of the tape occurs the cutting operations are carried out.

3. A printing device according to claim 1 or 2 wherein the first and second cutting blades are mounted on a common blade holder.

4. A printing device according to any preceding claim which includes a motor for driving said rolling motion.

5. A printing device according to any preceding claim wherein said selective disengagement of the first cutting blade is responsive to the distance over which the anvil holder has moved.

6. A printing device according to claim 2 wherein the or each anvil is provided with a circumferential slot aligned with its respective blade.

7. A printing device according to claim 2 wherein the anvil holder is mounted for rotation with respect to a carriage, the carriage being mounted for linear movement in the direction widthwise of the tape.

8. A printing device according to claim 7 wherein the carriage is mounted on a lead screw, rotation of the lead screw causing said linear motion of the carriage.

9. A printing device according to claim 2 wherein the anvil holder is biased relative to the first and second cutting blades.

10. A printing device according to claim 5 which comprises a first detection switch for detecting a home position relative to the width of the tape and a second detection switch for detecting the distance travelled by the cutting mechanism.

The Patent Office

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Application No: GB 9614112.2
Claims searched: 1-10

Examiner: Hal Young
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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B4B ; B6F(FAF)

Int Cl (Ed.6): B26D(1/03, 45) ; B41J(3/407 ; 11/70)

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	EP0711637 A1	(ESSELTE) see figs and lines 51 of column 4 to line 28 of column 5.	1
A	EP0652110 A2	(BROTHER) see whole document.	1
A	EP0578372 A2	(ESSELTE) see whole document.	1

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